

Serial No.: 10/763,533

IN THE DRAWINGS:

Applicant submits herewith a Replacement Sheet of drawings including Figures 5 and 6. This sheet of drawings reflects corrections to Figure 6 to add the legend "PRIOR ART" as required by the Examiner.

REMARKS

I. Status Summary

Claims 1-15 are pending in the present application. Claims 1-7, 9, 13 and 14 stand rejected and claims 8, 10-12 and 15 have been withdrawn from consideration based upon a Restriction/Election Requirement. Claims 1, 11 and 13 have been amended and claim 4 has been cancelled. No new matter has been introduced by the present Amendment. Reconsideration of the application as amended and based on the arguments set forth hereinbelow is respectfully requested.

II. Restriction/Election Requirement

The Examiner has acknowledged the election without traverse of claims 1-15 drawn to species 1. The Examiner contends that upon examination, claims 8, 10-12 and 15 are not readable on the elected species 1, and therefore claims 8, 10-12 and 15 have been withdrawn from further consideration as being drawn to a nonelected species, there being no allowable generic or linking claim. Applicant respectfully disagrees and requests reconsideration of the withdrawal of claims 8, 10-12 and 15.

Independent claims 1, 11 and 13 as amended are directed to the device illustrated in Figure 1 of the application. Furthermore, the device of Figure 1 is generic to the devices of Figures 2, 3 and 7-9 since only additional features are added to the structure of Figure 1. For instance, the device for digital pulse width modulation according to the present invention comprises a filter device **11**, a quantization device **13**, a PWM mapper device **15**, and a feedback loop **17** for feeding back the digital

PWM signal to a loop input signal (see elements (a) through (d) of pending claim 1). Figures 1-3 show three different embodiments all having the elements recited in pending claim 1. Also, the fourth of six embodiments as shown in Figures 7-9 all have a filter device **11**, a quantization device **13**, a PWM mapper device **15**, and at least one feedback loop **17**. For example, Figure 7 only illustrates the additional amplification device **16** and the analogue-to-digital converter **26** as compared with Figure 1.

For the above reasons, independent claims 1, 11 and 13 read upon the device illustrated in Figure 1. Claims 8, 10 and 12 depend from claim 1, and claim 15 depends upon claim 13, and therefore these claims also read upon the device illustrated in Figure 1. Since these claims read upon the device illustrated in Figure 1 as described above, applicant respectfully submits that claims 8, 10-12 and 15 are readable upon the elected species 1 according to Figure 1 of the application. As such, applicant respectfully requests reconsideration of the withdrawal of claims 8, 10-12 and 15.

III. Drawings

The Examiner states that Figure 6 should be designated by a legend, such as "PRIOR ART", because only that which is old is illustrated. Applicant submits herewith a Replacement Sheet of drawings including Figures 5 and 6. This sheet of drawings reflects corrections to Figure 6 to add the legend "PRIOR ART" as required by the Examiner.

IV. Claim Rejections Under 35 U.S.C. § 102

Claims 1, 4-7, 13 and 14 stand rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 6,812,876 to Miller. These rejections are respectfully traversed.

Independent claim 1 of the present subject matter recites a device for digital pulse width modulation. The device comprises a filter device for filtering a filter input signal; a quantization device for quantizing a filter output signal of the filter device; a PWM mapper device for generating a digital PWM signal from an output signal of the quantization device; and a feedback loop for feeding back the digital PWM signal to a loop input signal and for generating the filter input signal by subtraction. Claim 1 has been amended herein to recite that a different sampling rate is provided at the filter device than the sampling rate of the quantization device.

Likewise, independent claim 13 of the present subject matter recites a method for digital pulse width modulation. The amended method claim 13 comprises the steps of filtering a filter input signal in a filter device having a first sampling rate and quantizing a filter output signal of the filter device in a quantization device having a second sampling rate being different from the first sampling rate. The method further comprises the steps of generating a digital PWM signal from the output signal of the quantization device in a PWM mapper device; and feeding back the digital PWM signal to a loop input signal and generating the filter input signal in a feedback loop.

Miller is directed to a dither generation circuit and method for digital audio circuits that generates pseudo-random numbers that are then interpreted as 2's

complement numbers representing data points of a bipolar signal. The random number signal is high-pass filtered to reduce the energy contained in the audio band. The resulting dither signal is applied to the circuit in its main feedback loop and is effective to prevent idle tones. Because of its spectrally shaped characteristic this dither signal introduces less noise into the audio band of interest and thereby improves the overall signal-to-noise ratio of the audio circuit.

Although Miller discloses a device for digital pulse width modulation, the object of Miller is mainly to provide a dither generation circuit. In contrast, it is an object of the present subject matter to provide a device and method for digital pulse width modulation having high linearity and low power-loss.

As recited in the presently amended independent claims 1 and 13, different sampling rates are provided to the filter device and to the quantization device. For instance, as stated on page 7, line 32 – page 8, line 10 of the originally filed specification, the quantization device is operated with a sampling rate which is much lower than the sampling rate of the filter device. In an exemplary embodiment, the sampling rate of the quantization device is reduced by a factor of 2^N with respect to an overall sampling rate, for example, of the filter device. In contrast, Miller teaches that an overall sampling rate of 27 MHz is provided in the digital modulator **100** of Figure 1. The quantizer **142** according to Miller operates at this overall sampling rate and outputs in an embodiment with a 7-level-quantizer every eight clock cycles an output value to the associated mapper device **144** (see column 4, lines 21-31 of Miller). Miller explicitly states that “a 7-level sample is generated at the 27 MHz rate” which is the

sampling rate of the integrators **108, 122, 128**, adders **106, 120, 126, 132**, and gain stages **104, 110, 118, 124, 130, 140**.

Summarily, amended independent claims 1 and 13 require different sampling rates for the filter device and the quantization device. This arrangement leads to lower power-loss and an improved device and method for digital pulse width modulation with respect to the prior art teachings.

For the above reasons, applicant respectfully submits that Miller does not teach or suggest all of the elements recited by amended independent claims 1 and 13, and therefore claims 1 and 13 and dependent claims 4-7 and 14 are not anticipated by the cited reference. Applicant therefore respectfully requests that the rejection of claims 1, 4-7, 13 and 14 under 35 U.S.C. § 102(e) be withdrawn and the claims allowed at this time.

V. Claim Rejections Under 35 U.S.C. § 103

Claims 2, 3 and 9 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Miller in view of U.S. Patent No. 6,107,876 to O'Brien. These rejections are respectfully traversed.

O'Brien fails to overcome the shortcomings of Miller discussed above in relation to claims 1, 4-7, 13 and 14. O'Brien is directed to a digital input switching audio power amplifier that uses a simple logic circuit and/or software program for signal processing and, therefore, does not require an expensive DSP processor. There is no teaching or suggestion in O'Brien, even if combined with the teachings of Miller, of a device for digital pulse width modulation as recited in presently amended independent claim 1 (to

which claims 2, 3 and 9 depend). Specifically, there is no teaching or suggestion in O'Brien, even if combined with the teachings of Miller, of a device for digital pulse width modulation wherein the filter device and the quantization device require different sampling rates. As discussed above, this novel arrangement leads to lower power-loss and an improved device and method for digital pulse width modulation with respect to the prior art teachings.

For the above reasons, applicant respectfully submits that Miller and O'Brien, either alone or in combination, do not teach or suggest all of the elements recited by amended claim 1, and therefore that claims 2, 3 and 9, which depend from claim 1, are not obvious in view of the cited references. Applicant, therefore, respectfully requests that the rejection of claims 2, 3 and 9 under 35 U.S.C. § 103(a) be withdrawn and the claims allowed at this time.

CONCLUSION

In light of the above Amendments and Remarks, it is respectfully submitted that the present application is now in proper condition for allowance, and an early notice to such effect is earnestly solicited.

If any small matter should remain outstanding after the Patent Examiner has had an opportunity to review the above Amendments and Remarks, the Patent Examiner is respectfully requested to telephone the undersigned patent attorney in order to resolve these matters and avoid the issuance of another Official Action.

DEPOSIT ACCOUNT

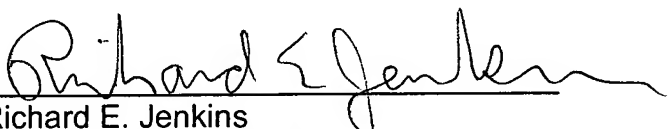
The Commissioner is hereby authorized to charge any fees associated with the filing of this correspondence to Deposit Account No. 50-0426.

Respectfully submitted,

JENKINS, WILSON, TAYLOR & HUNT, P.A.

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REJ/EEM/gwc

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